



A new approach to the full use of computer capability

ARTIFICIAL INTELLIGENCE THROUGH SIMULATED EVOLUTION

By LAWRENCE J. FOGEL, *President*; ALVIN J. OWENS,
Vice President, and MICHAEL J. WALSH, *Secretary-Treasurer*,
all of *Decision Science, Inc.*

The advent of high speed computers has made radical changes in information technology. Yet, almost all computer utilization is unnecessarily restricted to the explicit calculations indicated by the equations that describe the solution to the problem of interest. *Artificial Intelligence Through Simulated Evolution* suggests and develops additional ways to make use of the computer.

Specifically, the book describes a general technique which may be used to address a number of the fundamental problems of information technology including prediction, detection, discrimination, pattern classification, identification and the control of an unknown transducer.

In the book, the authors show how the random mutation of an arbitrary logical "organism" yields an "offspring." Both of these "machines" react to the available history and are evaluated in terms of their individual worth with respect to the given goal. The better of these machines is selected to serve as the new "parent." Such fast-time mutation and selection is continued with real-time decisions being based upon the logic of the machine which survives at the time those decisions are required. The efficiency of evolution is improved by introducing a cost for the complexity of each machine.

In addition to offering a new approach to some of the practical problems of information technology — evolutionary programming, as described here — opens the door to self-programming of computers and even to an automation of the scientific method.

Contents:

INTRODUCTION

Definition of Intelligence
Avenues toward Artificial Intelligence

EVOLUTIONARY PROGRAMMING

The Prerequisite Prediction
More General Goal-seeking

PREDICTION EXPERIMENT

2-symbol Prediction Experiments
8-symbol Prediction Experiments

PROBLEMS OF DATA REDUCTION AND ANALYSIS

Diagnosis, Detection, and Discrimination
Pattern Recognition and Classification

CONTROL SYSTEM DESIGN

Control of an Unknown Plant
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SOME IMPLICATIONS

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APPENDIXES

- A: Evolutionary Prediction Restricted to Cyclic Models of the Environment
- B: Concerning Measures of Complexity
- C: Logic and Flow Charts of an Evolutionary Program
- D: Finite-State Machines as Primitive Recursive Functions
- E: The Logical Steps of the Scientific Method

1966.

184 pages.

\$9.95.

Order from your bookseller — or order direct from Wiley by asking for F 26516 Fogel: *Intelligence*.

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**What do Robert Ash, Charles P. Bourne
L. I. Gutenmakher, Ira G. Wilson and
Marthann E. Wilson have in common?**

✓ information ✓ books ✓ and Wiley

*Robert Ash of the University of Illinois
is the author of*

INFORMATION THEORY

Readers have called this book, "excellent," "mathematically precise and sound," and "readable." It covers three major areas in detail: analysis of channel models and the proofs of coding theorems; construction of error-correcting codes; and statistical properties of information sources. Many unique features and sixty problems with detailed solutions distinguish the book. Interscience Tracts in Pure and Applied Mathematics, Volume 19.

1965.

339 pages.

\$13.50.

*Charles P. Bourne of Stanford Research Institute
is the author of*

METHODS OF INFORMATION HANDLING

"... remarkable for its completeness... its clarity of presentation, and its freedom from bias... It shows a broad and eclectic knowledge of the literature. It manages (most amazingly) to discuss machines and devices, giving facts and figures without either being misleading or offering judgments... It seems useless to carry this eulogy further... Bourne has set out to provide a clear and basic volume on the subject; broadly speaking, he has done this ably indeed." — American Documentation. A publication in the Wiley Information Sciences Series.

1963.

241 pages.

\$12.95.

*L. I. Gutenmakher, Director of the Laboratory for
Electromodelling, U.S.S.R. has written*

ELECTRONIC INFORMATION-LOGIC MACHINES

Translated by Rosalind Kent; edited by Allen Kent. "Professor Gutenmakher is highly informative in his discussions of hardware and in the calculations to justify the future use of "info-logic" machines; and also quite entertaining in the "scientific science-fiction" approach to the ultimate capability of these systems, programmed, but no longer limited, by humans!... The book, then, is useful, not only for what it says explicitly but also for what it implies — that the blue sky knows no iron curtain!" — Herbert Ernst, in *Mathematics of Computation*. An Interscience Book.

1963.

170 pages.

\$8.00.

*Ira G. Wilson and Marthann E. Wilson
are the co-authors of*

**INFORMATION, COMPUTERS, AND
SYSTEM DIVISION**

An original contribution to understanding complex systems, this book offers a new definition of system design problems, as well as a whole new approach to system design. The first part of the book deals with principles of information and systems, the second with a description of the life process of a new system and the steps involved in its construction, the third with a more mathematical approach. A publication in Wiley's new Systems Engineering and Analysis Series, edited by Harold Chestnut.

1965.

341 pages.

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